

INFORMATION ON GROUP TRAINING COURSE

***RESEARCH ON ENVIRONMENTAL
TECHNOLOGY***

JFY 2007

集團：環境調和技術

**COURSE NO.: J-07-00875
(Project No: 0780729)**

July 24, 2007 ~ March 8, 2008



THE GOVERNMENT OF JAPAN
JAPAN INTERNATIONAL COOPERATION AGENCY



Preface

The Japanese Government extends official development assistance (ODA) to developing countries to support self-help efforts that will lead to economic progress and a better life for the citizens of those countries.

Since its foundation in 1974, the Japan International Cooperation Agency (JICA) has implemented Japan's technical cooperation under the ODA programme.

Currently, JICA conducts such activities as training, dispatch of experts, provision of equipment, project-type technical cooperation, development study, dispatch of cooperation volunteers (JOCV), survey and administration of capital grant aid programmes.

The training programme for overseas participants is one of JICA's fundamental technical cooperation activities for developing countries. Participants come from overseas in order to obtain knowledge and technology in a wide variety of fields.

The objectives of the JICA training programme are:

- (1) to contribute to the development of human resources who will promote the advancement of developing countries, and
- (2) to contribute to the promotion of mutual understanding and friendship.

There exists an urgent need to address the identification and solution of the major characteristic issues in developing countries in order to solve the environmental pollution problems caused by economic and industrial activities, and to promote global environmental conservation and sustainable development. It is the prime task for us 1) to improve the environmental information and technology that make us possible to promote sustainable development, and 2) to foster researchers who share the awareness and technology and play a leading role in the field of environmental technology in developing countries.

The JICA's Group Training Course "Research on Environmental Technology" is designed by AIST* for researchers in the field of environmental technology for industry with the aims 1) to master research and technical methods and to play a leading role in the field of environmental technology in their own countries, and 2) to share environmental awareness and technology so as to solve the environmental pollution problems. The participants will study environment-friendly technologies through the course, which is completely research-oriented and based on the laboratory work under the advice of the host-researchers.

* cf. http://www.aist.go.jp/index_en.html

I. Course Description

1. Course Title (No.): Research on Environmental Technology (J0700875)

2. Course Objective/Outcome:

The objective of this program is to master appropriate technologies and skills, and to develop leading researchers in the field of environmental technology.

3. Course Outputs:

To achieve the said objective, participants are expected to produce the following outputs by the end of this course:

- (1) to master methods to carry out research activities by themselves
- (2) to deepen knowledge on environmental technology
- (3) to build a broad network with other researchers
- (4) to make a presentation at an academic conference
- (5) to make a technical report as a result of the research activities in Japan

After returning to his/her country

- (6) to make a final report on the evolution of his/her research subject

4. Total Number of Participants: 5

5. Eligible / Target Organization: Public Research Institute, University

6. Language to be used in this Course: English

7. Course Program:

Preparatory Phase (Before coming to Japan)	
Contents	Details
Research Proposal	See for ANNEX-II and III for details

Program in Japan (Jul. 24, 2007 ~ Mar. 8, 2008)
See II 3., as well as ANNEX-I for details

Development Phase In 6 months after returning home countries	
Contents	Details
Finalize the Final Report and its submission to Japan	After sharing the contents of the Final Report written in Japan at the respective organizations, those organizations will elaborate the suggestion and participants finalize the Final Report. The Final Report will be submitted to Japan in 6 months after finishing the program in Japan together with the progress of their activities at the respective organizations.

II. Conditions and Procedure for Application

1. Responsibility of the Participating Countries/Organizations:

- (1) It is strongly requested for the government of the participating country and organizations concerned to nominate applicants who fulfill the requirements for this course and have high motivation and strong commitments to address the current problems in your country/organization.
- (2) If any of the applicants are accepted, the organizations to which the applicants belong are required to support them to focus on the Preparatory Phase described in I. 7.
- (3) After the Program in Japan, the organizations are desired to facilitate the participants to spread what they learned in the course to the people and organizations concerned and/or to realize the final reports they prepared in the course.
- (4) This course includes the Development Phase as well as the Preparatory Phase and the Program in Japan. This means that the course does not complete unless the participants finish the Development Phase as well. It is, therefore, requested for the participants' organizations to fully support the implementation of the Development Phase to achieve the set course objective.

2. Qualifications of Applicants:

Essential Requirements for This Course

- 1) Present position, assignment:
 - **Researchers** in the field of environmental technology for industry **in public researching institutes or universities**
(Researchers from private companies* and administrative officers are not qualified for this course)
- 2) Occupational Background: have a minimum of three (3) years of research experience (five (5) years for Bachelor's degree holders) on the topic that the applicant has selected for individual research
- 3) Educational Background: have master's degree or equivalent qualification
- 4) Language: be proficient in spoken and written English; have a score over 500 points of TOEFL or its equivalent
- 5) Age: be less than forty (40) years of age in principle
- 6) Health: be in good health, both physically and mentally, to participate in the program in Japan (please be fully understood that the training over a long period like this course may pose risks to pregnancy), and
- 7) Not be serving in military.

* For this condition in cases where the nominee comes from a non-governmental institution, it must be confirmed that the duties of the nominee are the same as those of nominees from the governmental institutions mentioned above through the submission of the statement shown in Annex-IV.

3. Required Documents

- (1) Nomination Form: should be submitted by **May 31, 2007**
- (2) Research Proposal: should be submitted by **May 31, 2007**

Applicants should **select up to three (3) topics** on the list in the ANNEX-II, **list them in order of priority** in the Research Proposal attached as the ANNEX-III and submit it with the Nomination Form. The Research Proposal should be typed on A4-sized paper with the format indicated in the ANNEX-III. It is requested to make a clear and detailed research proposal of each of selected subjects listed in the ANNEX-II in not less than 800 words. The proposal will be used for screening the applicants. **The Nomination Form without the proposals will be rejected.**

4. Procedure for Application and Selection

- (1) Submission of the Documents for Selection:

Governments desiring to nominate applicants for the Course should submit (1) original Nomination Form and (2) Research Proposal to JICA Office (or the Embassy of Japan) by **May 31, 2007**.

- (2) Selection:

JICA Office (or the Embassy of Japan) accepts the documents for selection, carries out the pre-screening, and send the documents to JICA Center in charge of this course. The JICA Center in charge will hold a selection meeting with organizations concerned in Japan and decide the applicants to be accepted among those who fulfill the set requirements described in II.2 above. In case the number of applicants is more than the capacity (5 participants) of this course, some applicants may not be accepted due to the limited number of seats even though they fulfill the requirements.

Remarks:

- a. After the training institution, AIST, receives the Nomination Forms and Research Proposals through JICA, prospective host researchers of AIST may contact the applicants by E-mail or FAX to obtain additional information and confirm the details of individual research works for the screening processes. This communication will avoid any misunderstandings on the contents of individual research works between the applicants and host-researchers.
- b. Applicants may **not always be allotted the subject of their first priority.**

- (3) Notice of Acceptance:

The JICA office (or Embassy of Japan) will inform the applying government of acceptance or non-acceptance of nominees' application **no later than June 22, 2007**.

5. Rules for Attendance:

Participants are requested to observe the following rules for attending the course:

- (1) to observe strictly the course schedule,
- (2) not to change course subjects or extend the period of stay in Japan,
- (3) not to bring any members of their family,
- (4) to return to their home countries at the end of the Program in Japan according to the travel schedule designated by JICA,
- (5) to refrain from engaging in political activities or any form of employment for profit or gain, and
- (6) to observe the rules and regulations of their training institutions and their place of accommodation, and not to change accommodation designated by JICA.

*Participants who have successfully completed the Program in Japan will be awarded a certificate by JICA.

III. Administrative Arrangements

1. Travel to Japan:

(1) Air Ticket:

Round-trip ticket between an international airport designated by JICA and Japan will be borne by JICA.

(2) Travel Insurance:

Travel insurance is not insured by JICA.

2. Accommodation:

JICA will arrange the following accommodations for the participants in Japan:

Tsukuba International Center (JICA TSUKUBA)

Address: 3-6 Koyadai, Tsukuba-shi, Ibaraki-ken 305-0074, Japan

TEL: 81-29-838-1111 FAX: 81-29-838-1119

(81: country code for Japan, 29: area code)

Remarks:

The place of accommodation may differ according to the individual research subject selected by each participant. Some of the individual research works will not be taken place in AIST in Tsukuba, but in other research bases of AIST located in other prefectures (see ANNEX-I).

3. Living Expenses:

Following expenses will be provided for the participants by JICA:

- (1) Allowances for accommodation, living expenses, outfits and shipping
- (2) Expenses for study tours
Basically paid in the form of train ticket(s) or chartered bus.
- (3) Free medical care for participants who become ill after arrival in Japan (costs related to pre-existing illness, pregnancy or dental treatment are not included)
- (4) Expenses for program implementation including materials

For more details, please see p. 9-16 of the brochure for participants titled “KENSU-IN GUIDE BOOK”, which will be given to the selected participants before (or at the time of) the pre-departure orientation.

4. Course Implementing Organization:

National Institute for Advanced Industrial Science and Technology (AIST)

Address: 1-1-1 Umezono, Tsukuba-shi, Ibaraki-ken 305-8568 Japan

Tel: (+81-29)- 861-8011 (International Affairs Department)

Fax: (+81-29)- 862-6249 (International Affairs Department)

E-mail: *handa-keiji@aist.go.jp* (International Affairs Department)

(81: country code for Japan, 29: area code)

URL: *http://www.aist.go.jp/index_en.html*

5. Pre-Departure Orientation:

A pre-departure orientation will be held at JICA Office (or Embassy of Japan) to provide the selected candidates with details on travel to Japan, conditions of the Program in Japan, and other matters. Participants will see a video “Training in Japan,” and receive a textbook and cassette tape, “Simple Conversation in Japanese.” A brochure, the KENSU-IN GUIDE BOOK, will be handed to each selected candidate before (or at the time of) the orientation.

ANNEX

I Course Curriculum

II Research Topics of Individual Research Works

III Research Proposal

IV Letter of Declaration (only for those who work in private companies and whose status is the same as governmental officials)

V List of Organizations

ANNEX I Curriculum

Instruction Method

The training course is completely research-oriented and based on the laboratory work under the advice of the host-researchers in AIST. The individual research work is basically conducted on the topic selected by each participant, and participants are expected to do research by their own creativity and responsibility.

Curriculum

- 1) Orientation and Japanese Language Lessons in JICA (in group) ----- 2 weeks
- 2) Introductory Lectures in AIST (in group) ----- 1.5 weeks
The following lectures are given to provide participants with fundamental knowledge of the environmental technology.
 - A. Introductory Lectures
 - Introduction of the present situation and technology trend in Japan and the world (global environmental issues / environmental assessments / environmental monitoring / water pollution control / waste treatment etc.)
 - Lectures of host researchers on research subject to be conducted by each participant
 - B. Observation tour of the Research Institutes in Tsukuba city
- 3) Individual Research ----- approximately 7 months
Topics prepared for individual research works during the training course are shown in ANNEX-II. It is basically conducted on **one of the subjects under the research topics** selected by each participant. All participants will **not be always allotted the subject of their first priority**. Arrangements of individual research works will be made according to his/her own specialty and proposal written in the Research Proposal (see ANNEX-III).
- 4) Oral Presentation ----- 3 times
 - A. Presentation of Individual Research Proposal (one time)
At the beginning of the training program in AIST, participants are requested to give 20-25 min. presentations on the individual research subjects, related problems in their respective countries and brief introduction of the organizations where participants work. It is recommended to prepare visual aids such as transparencies or computer-aided presentation format (Microsoft Power Point, etc.) before departure from their respective countries.
 - B. Presentation of Technical Report (two times)
A technical report must be prepared both at the middle and the end of the training course, presented at the presentation session and submitted to JICA and AIST. It is also strongly encouraged to submit the report to an international academic journal or a conference by the end of the course.

C. Presentation of Final Report (one time)

A final report must be prepared at the end of the training course, presented at the presentation session and submitted to JICA and AIST. Final report is a paper on how the research subject will be evolved in his/her respective organizations and will contribute for solving the issue in the field of environmental technology in his/her countries.

5) Study Tours (in group) ----- approx. 1 week x 1 time

Group Study Tour related to facilities of environmental technology such as local governmental institutions and private manufacturing factories, etc. is conducted occasionally during the training course.

Remarks:

- a. JICA and AIST may give an award to a participant who completes the best performance at the end of the course.
- b. Individual lectures, conference and visits to relating facilities will be arranged, accordingly.
- c. **The place of accommodation may differ** according to the individual research subject selected by each participant. Some of the individual research works will not be taken place in AIST in Tsukuba, but in other research bases of AIST located in other prefectures[#].
- d. The curriculum may be subject to minor changes.

AIST has nine research bases including AIST Tsukuba --- AIST Hokkaido (Sapporo, Hokkaido); AIST Tohoku (Sendai, Miyagi); AIST Tsukuba (Tsukuba, Ibaraki); AIST Tokyo Waterfront (Koto, Tokyo), AIST Chubu (Nagoya, Aichi); AIST Kansai (Ikeda, Osaka); AIST Chugoku (Kure, Hiroshima); AIST Shikoku (Takamatsu, Kagawa) and AIST Kyushu (Tosu, Saga)

[cf. http://www.aist.go.jp/aist_e/guidemap/index.html]

ANNEX II *Research Topics of Individual Research Works*

The following topics are offered for the individual research work, in which a participant conducts laboratory work under the advice of the host-researcher(s). Applicants should **select up to three (3) topics** on the list in the ANNEX-II and list them **in order of priority** in the Research Proposal attached as the ANNEX-III. Some of the individual research works will not be taken place in AIST in Tsukuba, but in other research bases of AIST located in other prefectures as mentioned on page 7.

Topic 1 *Effective Energy Resources Utilization Technology*

1.1 Development of Hydrogen-selective Thin Palladium Membrane

Hydrogen is recently attracting more attention as an eco-friendly alternative energy source in near future. The development of efficient production and separation techniques of hydrogen is strongly demanded. The objective of this program is to promote research that covers the production and evaluation of effective metallic membrane systems which has longer life under high temperature. Based on electroless plating technique, ultra-thin palladium layer will be fabricated on the surface of inorganic porous bases, whose gas-permeability and separation factors will be tested. In order to develop larger scale separator, fundamental data is collected by using instruments of desktop scale. Derived permeation modules can be applied to the advanced hydrogen generation plants or fuel cells.

[Note] This subject is conducted at the AIST Tohoku located in Sendai.

1.2 Hydrogen Purification using Ionic Liquids

Hydrogen purification is a greatly important industrial process because hydrogen is an environmentally-friendly, clean, and promising future energy. In this research, we develop hydrogen purification using ionic liquids, which have high selectivity for gas solubility. H₂/CO₂ separation will be studied theoretically and experimentally.

[Note] This subject is conducted at the AIST Tohoku located in Sendai.

1.3 A Study of the Optimization of Designing Photovoltaic Hybrid Power Generation Systems

The participant of this OJT course learns the method, acquires the skills in research of photovoltaic (PV) hybrid systems, and conducts research on the optimal designing of this type system. The subject of this research is stand-alone hybrid system consist of PV system (in range of 100 Watt to several hundred kilo-watt) and complementary power sources such as battery storage, diesel generator, micro-hydroelectric power source and etc, which has connected to mini-grid for isolated village or community.

The course gives lectures and practical training on the (1) design method of PV system, (2) evaluation of solar energy resource, (3) performance analysis of PV module and PV systems, (4) simulation for PV hybrid system. Also in this OJT, the participants make a case study on

the below issues, in the village of their own country:

- Operation and control method of PV hybrid system
- Trend survey of electric power demand and pattern after village electrification
- Discussion about main parameters of optimal designing
- Analysis of economical efficiency for PV hybrid system

*[Specific requirement for application] As for an applicant, it is desirable to have the basic knowledge and experience on the **electrical engineering, photovoltaic power generation technology and other renewable energy technologies.***

1.4 Chemical Conversion of Ethanol with Nonthermal Plasma

The aim of this research is to understand fundamentals of discharge technology for energy conversion processes and to evaluate this technology in the production of hydrogen and/or synthesis gas from ethanol, which is one of the most promising energy sources in the future. Potential participant will operate nonthermal plasma reactors and determine substrate conversions and products yields mainly by gas chromatography.

*[Specific requirement for application] This research requires that applicant has some experience on **chemical analysis with gas chromatographs and data processing with MS Excel, etc.***

1.5 Co-firing and Co-gasification of Coal and Biomass with Fluidized Bed

Co-firing and co-gasification behavior of coal and biomass with fluidized bed will be studied. Woody or agricultural biomass is mixed with coal and fed to the fluidized bed combustor or gasifier. High moisture biomass can be burned efficiently in co-firing. And alkali metals in the biomass enhance the gasification rate of coal. In order to use this effect effectively, a new design of gasifier will be examined..

*[Specific requirement for application] Applicant should have the knowledge of **chemical engineering, especially chemical reaction engineering.***

1.6 Catalyst Development for Dimethylether (DME) Synthesis from Biogas

The present proposal is aimed at catalyst development for the thermo-chemical DME production from biogas. DME is useful as a substitution for liquid propane gas (LPG).

*[Specific requirement for application] Applicant should have research activities on **chemical engineering.***

Topic 2 Measuring & Monitoring

2.1 Simple Detection Technologies of Heavy Metal Ions in Water

Heavy metal contamination of drinking water, mining effluents, and soils seriously threatens the environmental and human health particularly in developing countries. Simple yet highly sensitive detection method for heavy metal ions provides advantages for on-site monitoring of water quality. The objective of this program is to develop simple testing kits

including test strips which can detect ppb level of heavy metals without using costly instruments. Nano-particles of various indicator dyes as signaling reagent of heavy metals will be prepared and coated on the membrane filter. Such nano-particle coated membrane filters can be used as the sensitive eye-detection papers. Moreover trace heavy metal ions can be enriched by filtration through the membrane filter and that amplify the sensitivity. The simple detection method will be examined in terms of detection limit, interferences and application to real samples.

[Note] This subject is conducted at the AIST Tohoku located in Sendai.

2.2 Characterization of Aerosols in Polluted and Clean Air Masses

- (1) Acquisition of the suitable collecting method and the physicochemical measurement of aerosols in the atmosphere.
- (2) Analysis of aerosol data observed in the atmosphere, using meteorological elements.
- (3) Field research at the observation site on the isolated island or in the rural area in Japan.

[Specific requirement for application] Applicant from Asian countries is desirable and must be skilled in operation of a personal computer.

Topic 3 Eco-Friendly Technology

3.1 Photocatalytic Purification of Contaminated Water using the Sunlight

Photocatalyst, mostly titanium dioxide (TiO₂), has the ability to decompose toxic substances using sunlight or indoor light and hence it is attracted as an energy-saving environmental purification technology. In the field of air purification, photocatalyst has been practically applied for the removal of NO_x, VOCs, odors, etc. However the application in the field of water purification is retarded due to slow reaction rate of toxic substances on photocatalyst. This training course involves learning fundamentals of photocatalyst and experiments for the degradation of trace amount of pesticides and sterilization that may be practically applied as water purification.

*[Specific requirement for application] Applicant who majored in **chemistry** can apply to this training course.*

3.2 Separation and Recovery of Metals from Wastes

This laboratory (<http://unit.aist.go.jp/emtech-ri/metrecy/en/index.html>) is studying the separation, recovery, and removal of valuable or toxic metals from solid metallic wastes such as printed wiring board, and industrial effluents discharged from the surface finishing process such as electroless plating, mainly by hydrometallurgical methods. The participant is requested to carry out the experimental study on the topic related to these studies. In this fiscal year, the participant would undertake the study on the hydrometallurgical recovery of copper from electronic wastes or the nickel recovery from the spent electroless nickel plating bath by solvent extraction.

[Specific requirement for application] Applicant to this course should have the specialized

*knowledge and some experimental experience either of **extractive metallurgy, chemical engineering, or analytical chemistry.***

3.3 Design Method considering Environmental Impact and Value of the Products

In this training course, the participant will study not only methods for environmental impact assessment but also methods for evaluating product design considering environmental impact of the products and obtaining suggestions for design improvement. After studying basics of some design tools such as QFD (quality function deployment) or conjoint analysis, the participant will proceed to original design evaluation method applying these design tools, which is called “total performance analysis.” Some case studies by applying the method to actual products will also be expected.

*[Specific requirement for application] Applicant must be able to communicate in Japanese or English without problem and should have basic knowledge about **design engineering.***

3.4 Combined Machining Technology for Reducing Environmental Impact

The target of this training course is to obtain skill and knowledge of “combined machining technology” to reduce environmental impact of manufacturing processes. The “combined machining technology” is a new manufacturing technology combining mechanical cutting, electrical machining and laser cutting properly. Through machining experiments, the participant will obtain knowledge for determining machining conditions appropriately. In addition, effect of environmental impact reduction by applying the technology will be assessed, too.

*[Specific requirement for application] Applicant must be able to communicate in Japanese or English without problem and should have experience of **machining**, and should not dislike non-desk work. Applicant must have very basic knowledge of **electro-discharge machining, electro-chemical machining and laser machining.***

Topic 4 Eco-Material

4.1 Synthesis and Structural Analysis of Eco-friendly Inorganic Material

In this program, participant conducts synthesis of an eco-friendly inorganic material and structure analysis of the material. The target material is clay which is useful as catalysts, absorbents, cosmetics ingredients, and so on. The synthesis will be carried out using various starting chemicals; industrial raw materials as well as natural materials. The synthesis is composed by unit operations such as, mixing, dissolving, washing, drying, powdering, hydrothermal treatments, centrifuging, and so on. As for characterization techniques, participant will learn thermal analysis, electron microscope, IR spectrum analysis, X-ray diffraction analysis, surface analysis, and so on. Improvements on the production methods will be discussed with lab staffs seeking an appropriate and efficient synthetic procedure.

[Specific requirement for application] MS or PhD awarded researcher are preferred in the

fields of chemistry, material science, or environmental engineering.

[Note] This subject is conducted at the AIST Tohoku located in Sendai.

4.2 Sustainable Green Technology Development by Extending Lives of Metallic Materials Systems

Extending the lives of a metallic material and its products strongly contributes to environmentally conscious techniques, because it is possible to cut the energy for reproduction of them. Metal surface is treated electrochemically or physicochemically (ultraviolet or infrared light irradiation) to improve the environmental resistivity by making wide terrace which is atomically flat surface in examining treatment conditions and processes. The crystallinity of treated surface is evaluated with low energy electron diffraction (LEED-AES), the depth profile of chemical components with an X-ray photo electron spectroscopy (XPS), the film thickness with spectroscopic ellipsometry (SE), the terrace width and structure in a nanometer scale with a scanning probe microscopy (SPM), and environmental resistivity by the response velocity against a potential change with a potentiostat (PS). Atomically flat surface can supply ultra-clean environments with green chemical processes and can save the water for cleaning the pipes and chambers in milk industries. Under these jobs training, the overall advantages of surface treatment technologies will be mastered.

*[Specific requirement for application] Applicant should be **material scientist or material engineer.***

[Note] This subject is conducted at the AIST Tohoku located in Sendai.

Topic 5 Biomass Utilization

5.1 Production of Polyunsaturated Fatty Acids using Modified Microorganisms for New System of Functional Lipids with Lower Environmental Load

Polyunsaturated fatty acids, PUFA, have come to attract attention for its specific physiological activities. The sole source of PUFA supply depends on marine resources, which may be limited in the near future. The research objective is to establish the efficient and stable system of PUFA production using the oleaginous and genetically modified microorganisms from biomass such as plant oils and evaluate the possibility of its application. The novel supply system of PUFA that are rarely found in natural resources will be established by the application of this technology. This work will bring about a large profit to establish the new production system of the functional lipids with lower environmental load to supply the increasing demand. The basic techniques for microbiology, lipid analysis, and genetic engineering, etc. will be learned through research activities

*[Specific requirement for application] Applicant with basic knowledge on **analytical chemistry, biochemistry or microbiology** is suitable.*

5.2 Research for Industrial Wastewater Treatment and Biorefinery Production with Microalgae *Spirulina platensis*

The industrial use of microalgae is important for environmental protection, as it has the potential to assist in the reduction of CO₂ emissions, which are now a serious global problem. This should be coupled to wastewater treatments, and be based on mass cultivation and extraction of useful substances from the microalgae. Genetic engineering will be a key to develop appropriate technology.

In this technical course we learn basic technique for handling microalgae especially for commercially important microalgae *Spirulina*, to cultivate potential ability in managing practical problems and to learn genetic transformation technique with Tn5 Transposase–Transposon Complex aiming to produce bioplastic.

*[Specific requirement for application] We need basic knowledge for **molecular biology** and the experience to **culture bacteria**, especially for *E.coli* and microalgae.*

*[Note] This subject is conducted at the **AIST Kansai** located in **Ikeda, Osaka**.*

5.3 Synthesis and Evaluation of Biodegradable Polymers

Participant is requested to learn knowledge and techniques of monomer and polymer syntheses, characterization, and physical property and biodegradability evaluation in order to develop environmentally friendly plastics derived from biomass.

Suggested (possible) topics are as follows:

(1) Synthesis of bio-based monomers:

Many kinds of compounds such as levulinic acid, itaconic acid, and hydroxymethylfurfural, which are derived from biomass (sugars), are converted to monomers for synthesis of biodegradable polymers.

(2) Synthesis of biodegradable polyesters and polyamides:

Many kinds of copolyesters, copolyamides, copolyesteramides, and copolyesterethers are synthesized using a wide variety of monomers such as lactide, caprolactone, pyrrolidone, ethylene oxide, and so on. The chemical structures and physical properties of polymers thus obtained are analyzed by FT-IR, NMR, DSC, and GPC.

(3) Evaluation of biodegradability of polymers by enzymes, compost, and activated sludge:

Polymers obtained above are subjected to biodegradability test using enzymes, compost, and activated sludge. The biodegradability is analyzed in relation to chemical structures and physical properties.

Hardware and Software Environment:

FT-IR, NMR, GPC, HPLC, DSC, Hot press, Mini-extruder, Activated sludge fermentor, TOC, BOD tester, Tensile tester, Injection molding machine, Microbial oxidative degradation analyzer

*[Specific requirement for application] Applicant is expected to have basic knowledge and experimental techniques on **polymer chemistry**.*

*[Note] This subject is conducted at the **AIST Kansai** located in **Ikeda, Osaka**.*

5.4 Development of Environmentally Friendly Biodegradable Composite Materials from Biomass

Training for development of biodegradable polymer composites consisting of biodegradable plastics such as poly(lactic acid) and biodegradable fillers such as cellulose and natural fibers from biomass such as agricultural waste. Obtained biomass plastic composites are characterized on properties such as biodegradable, mechanical, and thermal properties based on ISO evaluation methods. In addition, the method of determining biomass carbon contents using accelerator mass spectrometry is studied.

*[Specific requirement for application] Simple synthesis of polymers and measurements of physical properties such as thermal analysis and mechanical tests will be studied in this training course. It is necessary for applicant to have **fundamental knowledge for above studies.***

Topic 6 Human Health

6.1 Safety Evaluation of Nanoparticles and Drugs in Living Systems

Modern society is facing a severe challenge to environmental stresses that arises from industrial pollutants, automobiles, waste-disposals, agricultural pesticides etc. Increased environmental stress is reflected largely by an exponential increase in a variety of diseases including cancers. By 2020, one in three people is expected to have one or the other kind of cancers during his lifetime. Hence, there is an immediate need to identify, design and develop anti-stress strategies including drug designing and their toxicity evaluation for safety to living systems. Our group has embarked interest on safety evaluation of anti-stress, anti-cancer drugs, and nanoparticles including that are used for delivery of drugs to the living systems. We adopt the use of human normal and cancer cells in parallel and characterize the molecular effects of drugs and nanoparticles including quantum dots. A variety of cell and molecular technologies including cell culture, molecular cloning of stress bio-markers and their antidotes, gene manipulations, high resolution live bio-imaging and pathway analysis will be adopted to examine safety of drugs and nanoparticles in living systems

*[Specific requirement for application] Applicant should be university or higher graduate in **biology.** It is desirable if he/she has research experience in some research institutes or during graduate course.*

6.2 Establishment of Biomarkers and Biomarkers-based Technologies for Environmental Stress, Aging and Cancer

Our lab has been interested to study the stress response in living systems that can be seen as aging, age-related diseases and cancer. Two stress responsive genes (mortalin and CARF) were initially cloned in our laboratory and are being functionally characterized for their role in aging, cancer, environmental stress and DNA damage response. Our goal is to establish these molecules as stress biomarkers and develop biomarker-based environmental stress detectors. The studies will be focused to determine the regulation of these proteins in response to a range

of environmental parameters such as radiations, pollutions and physiological stress. Such studies will involve the use of mammalian cell culture, molecular and cell biological techniques including gene expression and silencing, generation of antibodies, visual studies using confocal laser fluorescence microscope, micromanipulations, protein-protein interactions.

*[Specific requirement for application] Applicant should be university or higher graduate in **biology**. It is desirable if he/she has research experience in some research institutes or during graduate course.*

ANNEX III Research Proposal

RESEARCH PROPOSAL

for the Training Course "RESEARCH on ENVIRONMENTAL TECHNOLOGY"

(To be submitted with Nomination Form)

1. Name of Applicant (*as in your Passport; **underline your Family Name***)
2. Country
3. Contact address (*E-mail address, Fax number, etc.*)

*Host-researchers **may make a direct inquiry to applicants** about the research proposal by E-mail or FAX during the screening process.*

4. Organization and your position

*Please attach the **organization chart** and indicate **your present position** on the chart.*

5. Number and Title of the research topic selected from ANNEX-II

Priority	Subject Number and Title
1 st	
2 nd	
3 rd	

6. Description of the research proposal

*Applicants are requested to describe **environmental problems relevant to these subjects** in their countries and the **reason for their selection**. It should be **typed on A4-size paper** and **not less than 800 words for each selected topic**.*

Prospective host researchers of AIST may contact applicants by E-mail or FAX to obtain additional information and confirm the details of individual research works for the screening processes. This communication will avoid any misunderstandings on the contents of the individual research between applicants and the host-researchers.

*At the beginning of the training program in AIST, participants are requested to give 20-25 min. presentations on individual research subjects based on the research proposal and brief introduction of the organizations where participants work. It is recommended to prepare visual aids such as transparencies or computer-aided presentation format (Microsoft Power Point etc.) **before departure** from their respective countries.*

7. Research activities that you have done during the past five years
8. Major Publications --- *Please attach the abstract of the publication or essay to this form*
9. Detailed description of the research activities that you are carrying out at present
10. Primary objectives to be achieved by the participation in this course
11. Application and transfer of the acquired knowledge and techniques to your institute

*Note: 1) You must **fill out every item** in this Form and **attach abstracts** of your major publications.
2) Nomination Form without the Research Proposal will not be accepted.*

ANNEX IV *Letter of Declaration*

This training course is basically open to officials in central or provincial government or in local bodies of their respective countries.

Those from private companies whose status is the same as that of officials mentioned above should draw up and forward to JICA a statement using the following format, which should be endorsed by the applicant's government.

The contents of the statement are as follows:

- (1) Name of country
- (2) Name of applicant
- (3) Name of organization
- (4) Concrete description of the activities of the applicant's organization

(Please describe as concretely as possible)

If the organization takes the form of a stock company, please explain:

- a) Names of investors,
 - b) Respective investors' share of the total capital of the organization, and
 - c) Company's share of the market
- (5) Relationship between the organization (or the applicant) and the National Development Plan/Program of the Government.

For example, if the organization (or the applicant) is

- a) an advisory or consultative organization (advisor),
- b) a model of the national project of the government, or
- c) other

then please explain the nature of the organization and the applicant's duties as concretely as possible.

- (6) The document should be concluded with the statement below, and contain the signature, position, and name of the applicant, as well as the name of the organization of the official responsible for international/technical cooperation between the Government of Japan and the government of the applicant. The document should also indicate the date.

"I certify that I have examined this document and that I am satisfied the information presented is authentic. I hereby nominate Mr./Ms. xxx xxx as a candidate for the course on Research on Environmental Technology on behalf of the Government of xxx."

ANNEX V **List of Organizations**

List of the organizations where GI should be distributed (it is not limited to distribute besides the organizations listed below).

Argentina

- National Institute of Water

India

- Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR)
- Centre for Cellular and Molecular Biology
- Department of Biotechnology, Guru Nanak Dev University
- Department of Botanical and Environmental Sciences, Guru Nanak Dev University
- Department of Anatomy, Faculty of Medicine, Annamalai University

Indonesia

- Agency for the Assessment and Application of Technology (BPPT)
- Indonesian Institute of Sciences (LIPI)
- Research Center for Biology, Indonesian Institute of Sciences, LIPI
- Agency for Industrial Research and Development, Ministry of Industry

Malaysia

- SIRIM Berhad
- Malaysian Palm Oil Board

Mexico

- Centro Nacional de Investigación y Capacitación Ambiental (CENICA)
- Universidad del Mar

Philippines

- Industrial Technology Development Institute, Department of Science and Technology

P. R. China

- Chinese Academy of Sciences (CAS)
- Institute of Coal Chemistry, CAS
- Sino-Japan Friendship Centre for Environmental Protection (SJC)

South Africa

- The Council for Scientific and Industrial Research (CSIR)
- Council for Mineral Technology (MINTeK)
- Council for Geoscience (CGS)

Thailand

- National Science and Technology Development Agency (NSTDA)
- Thailand Institute of Scientific and Technological Research (TISTR)

Vietnam

- Vietnamese Academy of Science and Technology (VAST)



CORRESPONDENCE

For inquiries and further information, please contact a JICA office or Embassy of Japan, or address correspondence to:

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